UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/542,490	07/15/2005	Benoit Noetinger	612.45186X00	5318

20457 7590 04/09/2007

ANTONELLI, TERRY, STOUT & KRAUS, LLP
1300 NORTH SEVENTEENTH STREET
SUITE 1800
ARLINGTON, VA 22209-3873

EXAMINER	
JONES, HUGH M	
ART UNIT	**PAPER NUMBER**
2128	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/542,490	NOETINGER ET AL.	
	Examiner	Art Unit	
	Hugh Jones	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 7/15/2005.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-3 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-3 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 15 July 2005 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 11/23/05, 7/15/05.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. Claims 1-3 of U.S. Application 10/542,490, filed 7/15/2005, are pending.

Drawings

2. The drawings are objected to because Fig. 5-7 and illegible and contain non-translated text.

3. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 1-3 are rejected under 35 U.S.C. 101 as being directed to nonstatutory subject matter since the claims as a whole are drawn to an abstract mathematical algorithm and do not provide for a practical application, as evidenced by lack of physical transformation or a useful, tangible, and concrete result:

- the claims do not provide for a concrete, useful result (since solutions are not assured for all cases [see the enablement rejections]);
- claims 1-3 do not provide for a tangible result.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 1-3 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

8. Claim 1 requires:

- considering an a priori interface form, assuming that the fluid displacements at any point thereof are stationary,
- determining the pressure field on either side of the a priori interface,
- iteratively changing the form of the interface until the pressures on either side of at least part of the interface become equal at any point of this part and
- assigning mean hydrodynamic properties uniformly to each zone of the medium delimited by each interface part, when said equalization is reached.

9. The first three limitations were not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Consider the following *realistic* example of an interface (fig. 9 of Popinet et al.):

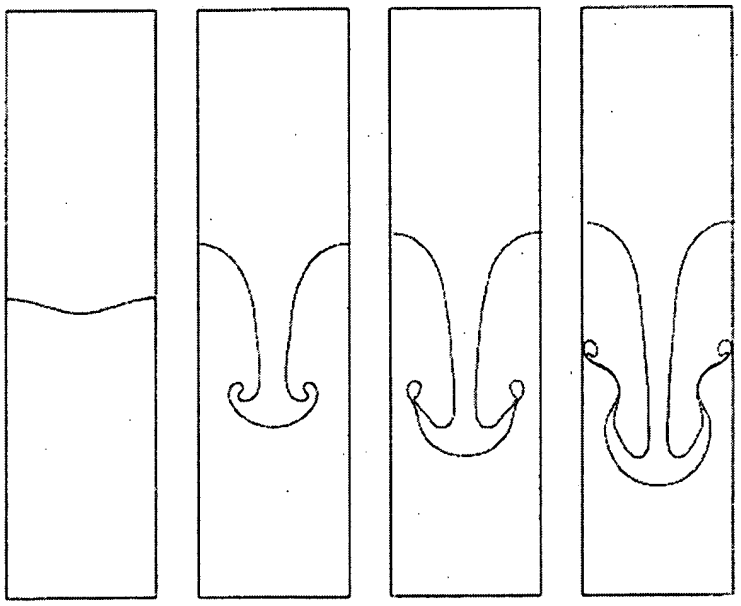
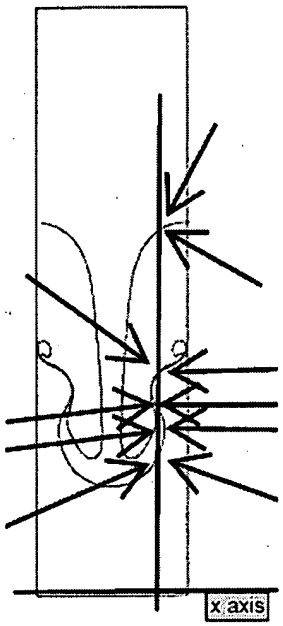


Figure 9. Rayleigh-Taylor instability on a 64 × 256 grid using the front-tracking algorithm.

Assume for the sake of argument that the interface corresponding to t=0.9 is taken to be the a priori interface. The interface for t=0.9 is reproduced; this time with arrows indicating all interfaces for a selected point (on the x axis):



10. Note, for this example, that there are five interfaces. The specification does not address such situations. The specification does not teach how to:

- provide for the *a priori* interface for any but the simplest situations (for example, what if the interface corresponding to t=0.9 is taken to be the a priori interface?);
- determine pressures on both sides of the *a priori* interface (the standard pressure equation) for any but the simplest cases;
- iteratively change the form of the interface until pressure equalization occurs for any but the simplest cases;
- set a "zone" for complex geometries (or any interface). In the situation in the above figure, the concept of "zone" appears to lose meaning.

11. The specification does not disclose whether stationary pressure equalization will actually occur, due to Rayleigh-Taylor instabilities. It also appears that if the initial interface is stationary, that the pressure would already be inherently equalized.

12. It is not clear how to iteratively change the form of the interface until the pressures on either side of at least *part of the interface becomes equal* at any point of this part. If the interface is an inclined plane, then how is it possible for the pressure to be equal at any point of a part of the interface? (consider gravity) Furthermore, for example, if there are two zones, is it possible to have pressure equalization between the interfaces within each of the two zones without the interfaces matching up (*what if there is a source in one zone and a sink in another zone*)?

13. The claims repeatedly refer to pressures on *either* side of the interface becoming equal at any point of a part of the interface. If the stationary solution for the interface is an inclined plane, then how is it possible for the pressure to be equal at any point of a part of the interface? (consider gravity) Furthermore, the claim as recited raises the question of whether pressures on *both* sides of the interface are required to be equal to each other.

14. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

15. Claims 1-3 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are the specifics of:

- *iteratively changing the form of the interface* until the pressures on either side of at least part of the interface become equal at any point of this part
- *segmenting the interface into several parts* and *then modifying the form of these different parts iteratively and separately*, until a pressure equalization is obtained on either side thereof,

Claim Interpretation

16. In the interest of compact prosecution, the Examiner makes the following claim interpretations in order to apply prior art to the claims. See *Ex parte Ionescu*, 222 USPQ 537 (Bd. Pat. App. & Inter. 1984).

17. In general, for the reasons provided earlier, the state of the claims in the instant application precludes a limitation-by-limitation assessment of the claimed invention compared to the prior art. The Examiner cannot interpret the meanings of the claims without relying on speculation. See *In re Steele*, 305 F.2d 859,134 USPQ 292 (CCPA 1962). However, in the interests of compact prosecution, a prior art rejection is applied nevertheless.

Claim Rejections - 35 USC § 102

18. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

19. A person shall be entitled to a patent unless –

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

20. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Popinet et al. (**P**) or Karksen et al. (**K**).

21. Specifically the art discloses:

1) A method for determining, in a stratified medium whose physical properties are known or estimated, at least one zone where an interface between a fluid in place in the medium and a flushing fluid, of known different viscosities and densities, injected in the medium, moves in a stationary manner, in order to simplify construction of a model simulating the flows in the medium, characterized in that it comprises the following
- considering an a priori interface form, assuming that the fluid displacements at any point thereof are stationary *(P: section 3 [front tracking algorithm]; sections 3.1-3.2; K: "The two phase flow model" [pp. 5-7] including the pressure equation [pp. 6-7 and its development on pp. 7-13]; piece-wise numerical strategy [pp. 7-13]; piece-wise linear front tracking algorithm [pp. 22-24]; finite element implementations [pp. 24-26])*,
- determining the pressure field on either side of the a priori interface *(P: section 3 [front tracking algorithm]; section 3.1 (advecting]; section 3.3 [Redistribution]; section 3.6. [Pressure gradient correction];; K: "The two phase flow model" [pp. 5-7] including the pressure equation [pp. 6-7 and its development on pp. 7-13]; piece-wise numerical strategy [pp. 7-13]; piece-wise linear front tracking algorithm [pp. 22-24]; finite element implementations [pp. 24-26])*,
- iteratively changing the form of the interface until the pressures on either side of at least part of the interface become equal at any point of this part *(P: section 3 [front tracking algorithm]; section 3.1 (advecting]; section 3.3 [Redistribution]; section 3.6. [Pressure gradient correction]; K: "The two phase flow model" [pp. 5-7] including the pressure equation [pp. 6-7 and its development on pp. 7-13]; piece-wise numerical strategy [pp. 7-13]; piece-wise linear front tracking algorithm [pp. 22-24]; finite element implementations [pp. 24-26])*and
- assigning mean hydrodynamic properties uniformly to each zone of the medium delimited by each interface part, when said equalization is reached *(P: section 3 [front tracking algorithm]; section 3.1 (advecting]; section 3.3 [Redistribution]; section 3.6. [Pressure gradient correction];; K: "The two phase flow model" [pp. 5-7] including the pressure equation [pp. 6-7 and its development on pp. 7-13]; piece-wise numerical strategy [pp. 7-13]; piece-wise linear front tracking algorithm [pp. 22-24]; finite element implementations [pp. 24-26])*.

2) A method as claimed in claim 1, characterized in that, for lack of obtaining a pressure equalization on either side of the interface along the latter, the interface is segmented into several parts and the form of these different parts is modified iteratively and separately, until a pressure equalization is obtained on either side thereof, the extent of each interface part when said equalization is reached, delimiting a favorable zone to which mean hydrodynamic properties are uniformly assigned *(P: section 3 [front tracking algorithm]; the simulation is done on cells in a grid; "piecewise linear interface calculation (PLIC:VOF) code" [pg. 785]; K: "The two phase flow model" [pp. 5-7] including the pressure equation [pp. 6-7 and its development on pp. 7-13]; piece-wise numerical strategy [pp. 7-13]; piece-wise linear front tracking algorithm [pp. 22-24]; finite element implementations [pp. 24-26])*.

3) A method as claimed in claim 1, characterized in that the form of at least one zone of the medium delimited by a stationary displacement interface is determined, which corresponds to different values of the flushing fluids viscosity, and the viscosity for which the stationary displacements in said medium are optimized is selected *(P: section 3 [front tracking algorithm]; section 3.1 (advecting]; section 3.3 [Redistribution]; section 3.6. [Pressure gradient correction]; K: "The two phase flow model" [pp. 5-7] including the pressure equation [pp. 6-7 and its development on pp. 7-13]; piece-wise numerical strategy [pp. 7-13]; piece-wise linear front tracking algorithm [pp. 22-24]; finite element implementations [pp. 24-26])*.

22. Any inquiry concerning this communication or earlier communications from the examiner should be:

directed to: Dr. Hugh Jones telephone number (571) 272-3781,

Monday-Thursday 0830 to 0700 ET,

or

the examiner's supervisor, Kamini Shah, telephone number (571) 272-2279.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist, telephone number (703) 305-3900.

mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 308-9051 (for formal communications intended for entry)

or (703) 308-1396 (for informal or draft communications, please label *PROPOSED* or *DRAFT*).

Dr. Hugh Jones

Primary Patent Examiner

March 10, 2007

HUGH JONES, Ph.D.
PRIMARY PATENT EXAMINER
TECHNOLOGY CENTER 2100